

CLAIMS

1. A process for forming a silicon-containing film, the process comprising:

introducing a substrate and gaseous reagents comprising an iodosilane precursor having three or less iodine atoms bound to the silicon atom and at least one reagent selected from an oxygen-containing reactive gas, a nitrogen-containing reactive gas, a hydrogen-containing reactive gas, a silicon-containing precursor, and mixtures thereof into a reaction chamber;

heating the reaction chamber to one or more temperatures ranging from 200°C to 900°C to form the silicon containing film on the substrate

provided that if the iodosilane precursor has three iodine atoms bound to the silicon atom then the heating step is conducted at one or more pressures less than 600 Torr.

2. The process of claim 1 wherein the iodosilane precursor is a compound of the formula $I_{(4-n)}SiH_n$ wherein $n = 1, 2, \text{ or } 3$.

3. The process of claim 1 wherein the at least one reagent comprises the nitrogen-containing reactive gas.

4. The process of claim 3 wherein the nitrogen-containing reactive gas is selected from ammonia, hydrazine, and mixtures thereof.

5. The process of claim 4 wherein the nitrogen-containing reactive gas is ammonia.

6. The process of claim 5 wherein the molar ratio of ammonia to the iodosilane precursor is at least 0.2:1.

7. The process of claim 3 wherein the at least one reagent comprises the oxygen-containing reactive gas.

8. The process of claim 7 wherein the oxygen-containing reactive gas is at least one selected from O_2 , O_3 , N_2O , NO_2 , and mixtures thereof.

9. The process of claim 1 wherein the at least one reagent comprises the oxygen-containing reactive gas.

10. The process of claim 1 wherein the heating is conducted at one or more pressures ranging from 10 mTorr to 20 Torr.

11. A semiconductor substrate comprising the silicon containing film produced by the process of claim 1.

12. A process for the chemical vapor deposition of a silicon-containing film on a substrate comprising: contacting an iodosilane precursor having three or less iodine atoms bound to the silicon atom with at least one reagent selected from a nitrogen-containing reactive gas, an oxygen-containing reactive gas, a hydrogen-containing reactive gas, a silicon-containing precursor, and mixtures thereof at one or more temperatures ranging from 200°C to 600°C and one or more pressures less than 600 Torr to form the silicon-containing film on the substrate.

13. A process for low temperature chemical vapor deposition of a silicon-containing film on a substrate, the process comprising:

heating the substrate to a temperature ranging from 200°C to 600°C and a pressure ranging from 10 mTorr to 20 Torr in a reaction chamber;

introducing gaseous reagents comprising an iodosilane precursor having three or less iodine atoms bound to the silicon atom and an at least one reagent selected from an oxygen-containing reactive gas, a nitrogen-containing reactive gas, a hydrogen-containing reactive gas, a silicon-containing precursor, and mixtures thereof into the reaction chamber; and

maintaining the temperature and pressure for a period of time sufficient to deposit the silicon-containing film on the substrate.

14. A process for the deposition of a silicon-containing film on a substrate comprising reacting an iodosilane precursor having a formula $I_{(4-n)}SiH_n$ wherein $n = 1, 2$, or 3 with at least one reagent selected from an oxygen-containing reactive gas, a nitrogen-containing reactive gas, a hydrogen-containing reactive gas, a silicon-containing precursor and mixtures thereof provided that if $n=1$ then the reacting step is conducted at a pressure ranging from 10 mTorr to 20 Torr.

15. A silicon-containing film formed by chemical vapor deposition of at least one chemical reagent comprising iodosilane having a formula $I_{(4-n)}SiH_n$ wherein $n = 1, 2$, or 3 wherein the chemical vapor deposition is conducted at a temperature ranging from 200°C to 600°C and a pressure ranging from 10 mTorr to 20 Torr.

16. A reactive mixture for the deposition of a silicon-containing film comprising: an iodosilane having a formula $I_{(4-n)}SiH_n$ wherein $n = 1$ or 2 and at least one

reagent selected from an oxygen-containing reactive gas, a nitrogen-containing reactive gas, a hydrogen-containing reactive gas, a silicon-containing precursor and mixtures thereof.